CONTENTS

ACKNOWLEDGEMENTS

ABSTRACT

Chapter – 1 INTRODUCTION - 1

Chapter – 2 REVIEW OF LITERATURE

2.1 Introduction to Vegetable Oils - 5
2.2 Vegetable Oil Chemistry - 6
2.3 Vegetable Oils As Alternate To Diesel - 7

2.3.1 Problems with the use of Crude Vegetable Oils in Conventional Engine - 9
2.3.2 Vegetable Oil Fuel Blends - 11
2.3.3 Vegetable Oil Heating - 11
2.3.4 Fuel Modification by Esterification - 12

2.4 Introduction to Low Heat Rejection Engine - 14

2.4.1 Heat Balance in a Conventional CI and LHR Engines - 15

2.5 Improved Fuel Economy in LHR Engine - 15
2.6 Emissions in LHR Engine - 21
2.7 Thermal Barrier Coatings - 23
2.8 Turbocharging and Turbocompounding - 26
2.9 Tribology - 28
2.10 Numerical Studies - 30
2.11 Scope Of Present Work - 32

Chapter – 3 EXPERIMENTAL WORK

3.1 Introduction - 37
3.2 Experimental Setup - 37

3.2.1 About the test engine - 38

3.2.1.1 Reasons for Selecting the Engine - 38
3.2.1.2 Modification of Test Engine - 38

3.2.2 Dynamometer - 38
3.2.3 Modifications on Fuel Injection Pump - 38
3.2.4 Supercharging Equipment - 39
3.2.5 Device for Changing Start of Injection - 39
3.2.6 Dynamic Injection - 39
3.2.7 Data Acquisition System - 41
3.2.8 General Working of the Setup - 41
3.2.9 Exhaust Gas Analyzer - 41
3.2.10 Smoke Meter - 41
3.3 Other Instrumentation
3.4 Experimentation
3.5 Data Processing
  3.5.1 Stages in Processing
  3.5.2 Absolute Pressure Signal
  3.5.3 Indicated Work
  3.5.4 Parameters of Performance
  3.5.5 Combustion Characteristics
3.6 Program for Data Processing

Chapter 4
EXPERIMENTAL TESTING OF THE ENGINE
WITH DIFFERENT LEVELS OF INSULATIONS

4.1 Introduction
4.2 Results and Discussion
  4.2.1 Brake Thermal Efficiency
  4.2.2 Volumetric Efficiency
  4.2.3 Exhaust Smoke Emission
  4.2.4 Hydrocarbon Emission
  4.2.5 Carbon Monoxide Emission
  4.2.6 Exhaust Gas Temperature
  4.2.7 Heat Rejection to Coolant
  4.2.8 Ignition Delay
  4.2.9 Combustion Duration
  4.2.10 Peak Pressure
  4.2.11 Maximum Rate of Pressure Rise
  4.2.12 Frictional Loss
  4.2.13 Cylinder Head Temperature
  4.2.14 Cylinder Liner temperature
4.3 Conclusions

Chapter 5
INVESTIGATIONS OF DIFFERENT VEGETABLE
OILS IN THE LHR TEST ENGINE

5.1 Introduction
5.2 Different Vegetable Oils
  5.2.1 Thumba Oil
  5.2.2 Simarouba Oil
  5.2.3 Neem Oil
  5.2.4 Cotton Seed Oil
  5.2.5 Rapeseed Oil
  5.2.6 Karanj Oil
  5.2.7 Palm Oil
5.3 Comparision of Seven Vegetable Oils in LHR Engine
Chapter - 6 SOME STUDIES TO IMPROVE VOLUMETRIC EFFICIENCY OF LOW HEAT REJECTION ENGINE

6.1 Introduction - 82
6.2 Experimental Work - 82
6.3 Results and Discussion - 83

6.3.1 Effect of Low Heat Rejection on the Volumetric Efficiency - 83
6.3.2 Effect of Supercharging on LHR Engine - 83

6.3.2.1 Effect of Supercharging on Volumetric Efficiency - 84
6.3.2.2 Effect of Supercharging on Brake Thermal Efficiency - 84
6.3.2.3 Effect of Supercharging on Combustion Parameters - 85
6.3.2.4 Effect of Supercharging on Exhaust Emissions and Temperature - 85

6.3.3 Effect of Simulated Turbocharging on LHR Engine - 86

6.3.3.1 Effect of Simulated Turbocharging on Brake Thermal Efficiency - 86
6.3.3.2 Effect of Turbocharging on the Volumetric Efficiency - 86
6.3.3.3 Effect of Turbocharging on Combustion parameters - 87
6.3.3.4 Effect of Turbocharging on Exhaust Temperature and Exhaust Emissions - 87

6.4 Conclusions - 88

Chapter - 7 INVESTIGATIONS ON THE USE OF NEW LUBRICANTS IN LOW HEAT REJECTION ENGINE

7.1 Introduction - 98
7.1.1 Friction Losses - 98

7.2 Development of New Lubricants - 99
7.3 Results and Discussion - 100

7.3.1 Use of Teflon Based Additive - 100
Chapter 7

7.3.1 Effect of Teflon Based Additive in SAE40 Oil
7.3.2 Effect of Teflon Based Additive in SPO1 Oil
7.3.3 Effect of Teflon Based Additive in SPO2 Oil
7.3.4 Effect of Teflon Based Additive in SPO3 Oil

7.4 Comparison of the new Oils with optimum amount of Teflon based additive

7.5 Use Of Paratone Additive
7.5.1 Effect of Paratone with SAE40 Oil
7.5.2 Effect of Paratone in SPO1 Oil
7.5.3 Effect of Paratone in SPO2 Oil
7.5.4 Effect of Paratone in SPO3 Oil

7.6 Comparison of the new Oils with optimum amount of Paratone

7.7 Effect of turbocharging with SPO3 oil in LHR engine

7.8 Conclusions

Chapter 8 CONCLUSIONS

SCOPE FOR FUTURE WORK

REFERENCES

Appendix-I

Appendix-II